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ABSTRACT

One benefit often expected to flow from Internet use in schools is an increase in equality of educational opportunity as all kinds of schools gain access to the same extraordinary set of resources. Yet, prior research suggests that patterns of technology access often mirror existing inequalities rather than mitigate them. This paper discusses the issues pertinent to equality that arose in Common Knowledge: Pittsburgh, a project with the goal of bringing Internet access to teachers in the Pittsburgh (Pennsylvania) public schools for use in instruction. It is concluded that, even though this project strongly valued equality, competing considerations led to some inequality of Internet access between schools serving different kinds of students. Furthermore, within given schools, numerous factors, including the perception of Internet use as an optional privilege and many teachers' lack of familiarity with the Internet and computing more generally, resulted in greater access for students who were already ahead of their peers academically and/or with regard to knowledge of computing. Topics discussed include the project and its setting, methods, and results related to equality of inputs (i.e., distribution of Internet access across the school system) and equality of educational processes (i.e., distribution of Internet access inside classrooms). Contains 15 references. (Author/DLS)

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The Internet and Equality of Educational Opportunity

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Abstract: One benefit often expected to flow from Internet use in schools is an increase in equality of educational opportunity as all kinds of schools gain access to the same extraordinary set of resources. Yet, prior research suggests that patterns of technology access often mirror existing inequalities rather than mitigate them. This paper discusses the issues pertinent to equality that arose in a project bringing Internet access to a large urban school district. It concludes that even though this project strongly valued equality, competing considerations led to some inequality of Internet access between schools serving different kinds of students. Furthermore, within given schools numerous factors, including the perception of Internet use as an optional privilege and many teachers' lack of familiarity with the Internet and computing more generally, resulted in greater access for students who were already ahead of their peers academically and/or with regard to knowledge of computing.

In recent years there have been many calls to connect teachers and students to the Internet [Carlitz 1991; Hunter 1992; Newman 1992]. Among the many benefits predicted are increased communication and collaboration between teachers, increased connection of the schools to the outside world, and increased equality of educational opportunity as students from schools of all types gain access to the same extraordinary set of informational resources. This emphasis on increased equality of opportunity as a potentially important outcome of school-based Internet use is epitomized in President Clinton's belief that the Internet will "revolutionize" education since "for the first time in the history of America...we can make available the same learning from all over the world at the same level of quality and the same time to all our children" [Clinton 1996].

There is no doubt that the Internet has the potential to help equalize educational opportunity by making the information resources available to students in all schools more similar than has been the case before. However, prior research on computer use in schools suggests that patterns of technology access and use often mirror and reinforce existing inequalities rather than mitigate them. For example, affluent schools provide their students with more computers on a per pupil basis than do poorer ones [Becker & Sterling 1987; Heaviside et al. 1996]. Furthermore, the amount and kind of computer use within a given district often vary in ways that reflect and sometimes reinforce existing social differences [Becker & Sterling 1987; Schofield 1995; Sutton 1991].

The goal of this paper is to shed light on the complex relation between the use of computer technology in schools and equality of educational opportunity by describing and analyzing the issues that arose pertinent to this topic in a project designed to bring Internet access to a major urban school district. Specifically, this paper will focus on two important aspects of equality -- equality of inputs and of processes [Good & Brophy 1986; Harvey & Klein 1989]. Educational inputs are the physical, financial, and human resources a school starts with. The input of interest here is Internet access. For the purposes of this paper, equality of Internet access is defined as there being no relationship between the kind and amount of Internet access in a given school (or program within a school) and the characteristics of the students that school (or program within the school) serves. An input, however, may be differentially available to or differentially utilized by different kinds of students within a school or even within a subsection of that school. Thus, educational processes -- what happens within the school -- are also very relevant to actual equality of opportunity. Before turning to our findings, we briefly describe the project studied, the district

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in which it was located, and the methods used in this research.

Common Knowledge: Pittsburgh and Its Setting

This paper is based on a four-year study of a NSF funded project called Common Knowledge: Pittsburgh (CK:P) -- one of four national testbeds in the United States designed to explore the Internet's potential for improving education. CK:P's goal, at the most general level, was to bring Internet access to teachers in the Pittsburgh public schools for use in instruction. During its first four years (mid-1993 to mid-97), CK:P provided a substantial amount of training and support, as well as hardware and Internet connections, to teams of educators at 20 schools.

Like many other urban school districts in the U.S., Pittsburgh has a substantial minority group population, with roughly 55% of its students being African American. Many of its students also face problems of familial poverty, with almost two-thirds receiving free or reduced-price school lunches because of low family income. In addition, there are major differences in the average socioeconomic status of white and African American students, with an accompanying marked achievement gap between the two groups overall. Addressing this gap is one of the district's prominently stated goals. Given this, it should come as no surprise that, as a project, CK:P placed an emphasis on enhancing equality of educational opportunity. To give just two very different examples, the proposal CK:P submitted to the NSF prominently featured promoting equality as one of the opportunities potentially provided by Internet access in the schools, and project staff commonly strove to achieve gender and racial balance when selecting students for Internet-related projects.

Methods

The major data-gathering methods used in this research were qualitative observations, semi-structured interviews, and the collection of archival material. Since the project began in 1993, we have conducted repeated observations in a wide variety of settings. This includes over 160 hours of observation in over 40 classrooms in which the Internet was being used. It also includes observation of over 125 meetings between different groups of teachers who have been involved with the project, and dozens of meetings of CK:P's educational and technical support staff. Trained observers used the "full field note" method of data collection [Olson 1976] which involves taking extensive hand-written notes during the events being observed. All notes were made as factual and as concretely descriptive as possible.

To gain insight into participants' perspectives, over 300 semi-structured open-ended interviews were conducted with a wide variety of individuals including over 100 teachers, 30 school district personnel, 14 CK:P staff, and 130 students. Archival materials, especially e-mail, were another important source of information pertinent to the issues discussed here. With participants' permission, the research team's address was added to virtually all group mailing lists connected with the project. This permitted collection of most normal e-mail between members of the various groups working on this project.

Both field notes and interviews were audiotaped, transcribed, coded and then analyzed using established qualitative methods [Miles & Huberman 1984; Strauss & Corbin 1990]. In the data analysis, our primary emphasis was on the development and systematic application of thematic categories to all data. Further, we paid close attention to triangulating data from the different kinds of sources.

Results

Equality of Inputs: Distribution of Internet Access Across the School System

CK:P did not have enough funds to provide Internet access and extensive support to every school and classroom in the district, although it did have a budget of over five million dollars. Thus, the issue of how this potentially valuable educational input should be allocated arose early in the project, just as it is likely to arise in any school district that must decide how to spend limited tax dollars. Since lead time was short during the project's first year, the first three projects to be supported by CK:P were selected by weighing considerations such as which schools had teachers knowledgeable and enthusiastic enough to successfully carry out Internet projects with little lead time and where the district already had decided to place new computer equipment and/or local area networks.

However, during CK:P's second year the project staff decided to select future schools based on an annual competition to which teams made up of small groups of interested teachers could submit proposals. The staff saw the development and successful implementation of this process as a major achievement, since they felt that the competition would encourage teachers to develop high quality curriculum projects and that support of the strongest of these would further CK:P's goal of stimulating creative and productive uses of the Internet in education. For a variety of reasons, including the desire to build political support for CK:P, the staff did not select these projects themselves. Rather, this task was left to a broadly representative and racially-mixed group that included individuals ranging from school board members to central administrators to community members.

In spite of the diversity of the group making the selection, the issue of equality of inputs arose almost immediately at the end of the first competition when a prominent African American member of the school board charged that the competitive process built in a bias against the very schools where the need was greatest. Critics of the process argued that teachers working in the schools facing the greatest social and academic challenges would have less time and energy to devote to writing proposals and developing new curricular approaches employing the Internet than their peers working in less difficult situations. In addition, since schools with higher achieving students, or with special programs likely to attract such students, were generally seen as more desirable places to work, teachers who were experienced or reputed to be unusually energetic and skilled were more likely to be able to secure positions there than their peers. It seemed reasonable to expect that such teachers would be more likely to write proposals, and to propose projects strong enough to win. Given this, it seemed plausible that district-wide competitions would end up favoring the schools with the higher achieving students. Since socioeconomic status and race were clearly connected to academic achievement in the district, as they are nationally, this would tend to work to the disadvantage of the students who were already disadvantaged by minority status or their relative poverty.

Examination of the seven schools selected in the first competition held by CK:P suggested that there was some basis for this concern. The one high school selected was only 20% African American, although almost 50% of the students in the district's high schools were African American. Students in this school were also somewhat, although not strikingly, better off economically than the average student. For example, 18% of them, as opposed to 25% of high school students district wide, came from families receiving public assistance. Similarly, the one middle school selected was a magnet school which had a somewhat lower percentage of African Americans than middle schools in the district in general (48% vs. 56%) and which served fewer students from families receiving public assistance than middle schools did on the average (17% vs. 40%).

The five elementary schools selected presented a somewhat more mixed picture. However, taken as a group, they did appear to enroll children who were somewhat more advantaged than the average child in the district. For example, two of the district's five most affluent elementary schools were selected, giving them a remarkably high success rate given that only three elementary schools were selected from the remaining forty-four. One of the three other schools selected was one of the few in the district with a student body containing less than 10% African Americans. (However, its students' socioeconomic status was somewhat below the district average since 52% of its students came from families receiving public assistance compared to 46% of elementary school families district wide). Only one of the elementary schools selected had a substantially higher proportion of African American students than average. Its student body had a socioeconomic status very similar to that of the heavily white school just described. Finally, although the district had 12 elementary schools that were 80% or

more African American, all but one of which were characterized by higher than average levels of poverty, none of these schools ended up with CK:P projects through this competition.

The issue of which schools got access to the Internet through CK:P, and what the implications of this were for educational equality and equity, received a substantial amount of attention from policy makers. However, even if access were equal across schools enrolling different kinds of students, the possibility remained that the Internet projects might be focused in niches in the schools which served non-representative samples of students since small teams of educators, ranging in size from 5-12 people from within a given school, served as the CK:P Internet teams and their students typically had greater access than others. This did occur and, when it did so, the students served were generally advantaged in one way or another compared to their peers. So, for example, one project in a school which was 99% African American and which had a student body characterized by high poverty rates was located in the honors track, which by definition served the most academically able students. As a group, these students tended to come from somewhat less poverty stricken families than their peers. Similarly, another CK:P team in a different high school which was 57% African American ended up using the Internet heavily in their smaller advanced language classes, which generally speaking had a lower proportion of African American students than the school.

As a project, CK:P made strong efforts to be inclusive and to mitigate the impact of existing inequalities on Internet access. For example, it secured additional funding targeted for schools serving the most disadvantaged populations. Also, project staff provided extensive training covering topics ranging from Internet use to proposal writing so that teachers from all schools could receive the help they needed to write strong proposals. In addition, CK:P provided modest levels of Internet access and support to sites that were not selected for more intensive focus, so that by the end of CK:P's fourth year over two-thirds of the schools in the district, including many of those serving the most disadvantaged students, had some form of access. However, the problems that arose regarding equality of access in this project, in spite of the relatively high priority this issue held in the minds of those responsible for implementing it, suggest just how complicated it may be to achieve. Furthermore, they highlight the fact that hard tradeoffs may need to be made between equality, equity, and maximizing the likely impact of any given dollar invested in educational technology.

Equality of Educational Processes: Distribution of Internet Access Inside Classrooms

Even if there is no relationship between the demographic characteristics of the students in a school or classroom and the likelihood that resources such as Internet access are located there, the question of whether or not students actually end up with equal access remains. At the classroom level we saw few if any cases where teachers blatantly used student characteristics such as race, gender, or socioeconomic status in a way that systematically denied or minimized access to any particular group. In fact, when such criteria were explicitly considered it was virtually always in a way that promoted equality of access across groups -- such as a teacher's consciously deciding to select one boy and one girl to engage in a particular Internet activity even though more boys than girls had volunteered. However, several educational process issues did lead to advantaged students often obtaining more Internet access than their peers. Ironically, this occurred in spite of the fact that many teachers believed that Internet access was particularly valuable for at-risk students.

First, teachers, especially those working in noncomputer lab settings, tended to see Internet access as an optional privilege rather than as a basic resource, such as textbooks or library materials, to which all students should have access. This view stemmed from several sources, including the fact that even in classes receiving full CK:P support teachers generally had many more students than Internet access points, which meant that Internet access was a scarce good. As such, it was most easily dealt with as a privilege, rather than something to which every student should or could have equal access. The view of Internet access as a privilege was also connected to a positive view of it on the part of teachers who went to the trouble to write a proposal to bring it to their classrooms. Students' generally very positive reactions to access reinforced the image of access as a privilege.

Another factor contributing to this view of Internet use was that work done on the Internet was often not part of the core curriculum upon which students were tested, so that teachers did not feel a responsibility to assure that all students got to use it in order to do the work expected of them. Although this situation was partly due to the relative scarcity of Internet-linked computers, it did not appear to be completely due to this. Rather, teachers had curriculum materials and accompanying tests that reflected the core of what they expected students to learn.

Internet work tended to be added on to this as enrichment, rather than integrated into the core curriculum. Since class time was limited, time spent on the Internet was sometimes seen as time not available for more pressing work.

Since Internet work was often seen as an optional privilege, the question of which students would gain access arose. Teachers frequently used access as a reward for good behavior, especially strong academic performance. Similarly, behavior of which the teachers' disapproved, especially social behavior of this nature, was seen as reason for removal of this privilege or for failure to bestow it. This tendency was exacerbated by teachers' concerns about students' inappropriate use of the Internet and by their concerns regarding the possibility that students might intentionally or unintentionally damage the computers to which they had access. Taken together, these factors tended to increase usage by students who were academically strong and to decrease use by those who were either weaker academically or less attuned to the schools' behavioral norms.

Teachers' genuine concern about the academic progress of their weakest students also often contributed to this inequality in access. Since Internet usage was generally not conceptualized as the quickest and clearest route to helping students master the core of the curriculum, some teachers believed that weaker students' time was better spent on more traditional activities. It is certainly possible that the teachers were correct in this assessment. However, to the extent that familiarity with computer use in general, and the Internet in particular, is useful in today's world, inequality in Internet access for weaker students created yet another potentially important dimension on which they were behind others. Furthermore, the stronger students' greater access to the Internet had the potential to increase any pre-existing motivational differences between them and their academically weaker peers since there was widespread agreement on the part of teachers and students that Internet use was motivating.

Another factor that contributed to disparity in access was that many teachers' lacked highly developed knowledge about the Internet and about computers in general. This led them to give greater access to students who were already knowledgeable in these areas rather than to spread access more broadly, since such students could use this resource most effectively and in a way that made the least demands on the teachers' already heavily obligated time. Such students were disproportionately white, male, and from relatively privileged socioeconomic backgrounds. Enhanced access, in turn, increased and highlighted the knowledge gap between them and their peers. One factor that appeared to contribute to creating the initial gap in expertise was home access. Previous research suggests that both males and relatively affluent students are more likely to have home computers and to engage in other activities such as attending computer camps than their female and less affluent counterparts [Hess & Miura 1965; Kraut et al. 1995; Sutton 1991]. Such appeared to be the case here as well.

Students' behavior sometime tended to reinforce the disproportionate access created by the kinds of process issues discussed above. For example, males and students of somewhat higher socioeconomic status than their peers sometimes made disproportionate voluntary use of the Internet in the school library before or after school. Similarly, teachers noted that girls were sometimes less assertive than boys in laying claim to computers when both they and others wanted to use them.

Conclusions

This study suggests that bringing the Internet to schools in a way that enhances educational equity is likely to be a complex process. First, there is the issue of whether this educational input will be distributed across schools and classrooms in ways that exacerbate or mitigate existing inequalities. In prior research, the association between access and advantage has usually been understood to reflect the differential tax base in poor and affluent communities. In CK:P's case, the inequality stemmed from something else entirely -- a desire to deploy scarce resources where they were most likely to be well utilized. Yet other considerations could also be weighed, and might lead to different kinds of inequalities. For example, there were those who suggested that CK:P should place more emphasis on concentrating resources where the need was greatest -- a strategy intended to enhance equity, although not necessarily equality of inputs. Furthermore, this study highlights the fact that distributing access equally across different kinds of schools and classrooms does not insure equality of use. Numerous educational process issues, from the way that teachers think about Internet use to differential pre-existing expertise on the part of different kinds of students, also shape usage patterns in ways that often reinforce existing inequalities.

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